

Specification

Title of the Invention

Key Input Device

5 Background of the Invention

The present invention relates to a key backlight for a cell phone or the like having an operation key section and, more particularly, to a key input device including a light-emitting means for
10 lighting or blinking an operation key section in different modes or colors in accordance with key operation.

In a cell phone having an operation key section constituted by a plurality of keys for operating
15 the cell phone, e.g., inputting a telephone number or mail using characters, the keys of the operation key section are formed from a transparent or translucent material. In addition, a plurality of light-emitting portions (key backlights) are arranged on the bottom
20 sides of these keys to light or blink the operation key section in different modes or colors in accordance with the operation of the cell phone.

Japanese Patent Laid-Open No. 2001-217904 discloses a technique of using an operation key section
25 as a notification means and display means by utilizing the above operation.

Fig. 7 shows the outer appearance of a cell

phone with an operation key section lighting function disclosed in the above reference. An operation key section 54 formed from a translucent member is comprised of a plurality of keys such as dial number keys 54a, a
5 signal transmission/reception key, an on-hook key 54b, a mail key 54c, and various setting keys. The operation key section 54 also serves as an input operation means for a control section in the cell phone body.

Multicolor light-emitting portions (key
10 backlights) 55 are arranged in correspondence with the respective keys. Each light-emitting portion is constituted by a multicolor LED or the like capable of emitting two or more different color beams. The emission mode of each multicolor light-emitting portion
15 55 is controlled by the control section in the cell phone body. In addition, the multicolor light-emitting portions 55 emit light beams in predetermined colors in accordance with various kinds of operation of the cell phone.

20 For example, musical notes are assigned in advance to the multicolor light-emitting portions 55 and the corresponding keys, and the multicolor light-emitting portions 55 are made to emit light beams in different colors in accordance with the musical notes
25 of melody sounds generated by the melody sound generating section in the cell phone body. Alternatively, when a plurality of melodies are set, the

multicolor light-emitting portions are made to emit light beams in different colors in accordance with the kinds of melodies. This makes it possible to discriminate, in accordance with an emission color, who
5 has made a call.

In addition, when mail is received, the multicolor light-emitting portion 55 corresponding to a numeric key indicating the number of incoming calls is made to emit light in accordance with the number of
10 received mail.

When the dial number key 54a lighted by the light emitted by the multicolor light-emitting portion 55 is pressed, the contents of the mail are displayed on a display section 53.

15 Many functions as added values, e.g., a mail function and browser function, are added to recent cell phones.

For example, in performing mail transmission using the mail function, the user must input a mail
20 message using keys of the operation key section of the cell phone.

The operation key section, however, has ten-odd keys at most. The user must input characters in various modes, e.g., the numeric input mode, kanji input
25 mode, and alphabet input mode using such limited number of keys. In general, therefore, the character input modes are switched by a character input mode changing

key to allow the user to input various kinds of characters by key input in a desired character input mode while checking an icon indicating a character input mode, which is displayed on a corner of the display
5 screen.

As described above, the user must set a desired input mode while checking the currently used input mode with a small icon displayed on a corner of the display screen.

10 If the character input mode is changed by an input error unintended by the user, he/she tends to overlook the change in mode with such a small icon. As a consequence, the input error makes the user waste extra time creating a mail message.

15 Summary of the Invention

It is an object of the present invention to facilitate confirmation of the currently used character input mode and allow a user to know a newly set character input mode upon occurrence of a change in
20 character input mode, thereby improving the efficiency of character input operation through an operation key section.

In order to achieve the above object, according to the present invention, there is provided a
25 key input device comprising key input means for inputting characters by key input in a plurality of character input modes, switching means for switching a

plurality of character input modes, a key backlight which is placed on a lower surface of the key input means and is lighted in a plurality of colors, and lighting control means for changing a lighting color of the key backlight in accordance with switching of character input modes.

Brief Description of the Drawings

Fig. 1 is a block diagram showing a key input device according to an embodiment of the present invention;

Fig. 2 is a block diagram showing the hardware arrangement and software arrangement of the key input device according to the first embodiment of the present invention;

Fig. 3 is a flow chart showing the operation of the first embodiment;

Fig. 4 is a block diagram showing the second embodiment of the present invention;

Fig. 5 is a block diagram showing the third embodiment of the present invention;

Fig. 6 is a view showing the outer appearance of a cell phone incorporating the present invention; and

Fig. 7 is a view showing the outer appearance of a conventional cell phone to which the present invention can be applied.

Description of the Preferred Embodiments

As shown in Fig. 1, a key input device 11

according to the present invention includes a key input section 12 for inputting character strings and the like and a key backlight 13 which is placed on the lower surface of the key input section and lighted in various different colors. In this case, the key input section 12 includes a plurality of keys 154a, 154b, and 154c (to be described later). The key backlight 13 has light-emitting means 155a (to be described later) located on the lower surfaces of the respective keys 154a, 154b, and 154c.

The key input device 11 also includes a mode switching section 14a which is connected to the key input section 12 to switch the character input modes of the key input section 12, and a key backlight lighting control section 14b which changes the lighting color of the key backlight 13 in synchronism with switching of the set character input modes. The key input device 11 is connected to the key backlight lighting control section 14b and includes a storage section 15 having a first storage section 15a and second storage section 15b.

In the key input device 11, the first storage section 15a cannot be overwritten, and the second storage section 15b can be overwritten.

As shown in Fig. 2, the hardware arrangement of the key input device 11 according to the present invention is constituted by a key input circuit 1 which receives input signals upon character input operation by

a user, and an LED circuit 2 which lights or blinks the key backlight. The software arrangement of the key input device 11 according to the present invention includes a character input control function 3 for
5 controlling character input modes such as a kanji input mode, and a key backlight lighting control function 4 for controlling the lighting color and light position of the key backlight.

The data handled by the key backlight lighting
10 control function is constituted by key backlight lighting setting data 5 for holding a setting indicating whether the key backlight is to be lighted or unlighted, key backlight lighting color data 6 for holding combinations of character input modes and lighting
15 colors, and key backlight lighting position data 7 for holding the positions of keys that can be used for character input operation in the respective character input modes.

Software programs 21 described above are
20 stored in the first storage section 15a in advance. Hardware 20 operates under the control of the software programs 21 to implement the function of each section described above.

Fig. 3 shows the operation of this embodiment.
25 The operation of the present invention will be described below with reference to Figs. 2 and 3.

When a signal is input to the key input

circuit 1 upon key operation (step S1), the key
backlight lighting control function 4 refers to the key
backlight lighting setting data 5 to check whether or
not a setting for lighting the key backlight has been
5 made for this key input signal (step S2).

If the determination result indicates an
"unlighting setting" (step S2: NO), the processing is
terminated without lighting the key backlight. If the
determination result indicates a "lighting setting"
10 (step S2: YES), it is checked whether or not the key
backlight of the LED circuit 2 is currently OFF (step
S3).

If the key backlight of the LED circuit 2 is
currently OFF (step S3: YES), the character input
15 control function 3 transfers a character input mode
signal to the key backlight lighting control function 4
to prepare for lighting of the key backlight (step S5).

If the key backlight of the LED circuit 2 is
currently ON (step S3: NO), the character input control
20 function 3 checks whether character input modes have
been switched (step S4).

If no character input modes have been switched
(step S4: NO), the state of the key backlight is kept
unchanged, and the processing is terminated.

25 If character input modes have been switched
(step S4: YES), the character input control function 3
transfers a character input mode signal to the key

backlight lighting control function 4 to prepare for changing of the color and lighting position of the key backlight (step S5).

Upon reception of the character input mode
5 signal from the character input control function 3 in step S5, the key backlight lighting control function 4 refers to the key backlight lighting color data 6 and key backlight lighting position data 7 and transmits key
backlight lighting color data and key backlight lighting
10 position data corresponding to the received character input mode to the LED circuit 2 (step S6).

In accordance with the received backlight
lighting color data and key backlight lighting position
data, the LED circuit 2 lights, in designated lighting
15 color, the backlights for keys that can be used for input operation (step S7).

The above embodiment has exemplified the
character input modes such as the kanji input mode. In
addition to them, however, a numeric input mode and the
20 like can be set, and the device can be switched to these modes as needed. In addition, the device may be
switched to an input mode based on the language spoken
in the counter where the device is used. For example,
the device may be switched to an English input mode in
25 an English-speaking country; a French input mode in a
French-speaking country; and a German input mode in a
German-speaking country. In addition, the key backlight

can be lighted in many colors such as red and blue.

A specific arrangement for multicolor lighting of the key backlight can be implemented by a proper means, e.g., the multicolor light-emitting portions in
5 the above reference. For example, red, green, and blue LEDs (light-emitting portions) are arranged as light-emitting portions. A transparent or translucent member is preferably used for each key of the key input, which is used for character input operation and the like.
10 In this embodiment, in synchronism with a character input mode, the entire key input section or only corresponding keys that can be used for input operation are lighted by key backlights in a corresponding color. This allows the user to visually recognize, through the
15 key backlights, the current character input mode and whether or not character input operation can be done.

In this case, the lighting color of each key backlight makes the user visually recognize the currently used character input mode and whether or not
20 character input operation can be done. When the character input mode is changed, the lighting colors or lighting positions of key backlights are changed. If, therefore, an unintentional change in character input mode occurs, the user can recognize the change before
25 performing key input operation. This leads to a reduction in input errors.

The second embodiment of the present invention

will be described next with reference to Fig. 4.

The second embodiment differs from the first embodiment in key backlight lighting color data 6. A characteristic feature of this embodiment is that a user
5 can change the combinations of character input modes and corresponding key backlight lighting colors.

The data of a combination designated by the user is stored in a storage area for user settings (b) different from a storage area for initial settings (a).
10 For example, the initial settings (a) are stored in a first storage section 15a, and the user settings (b) are stored in a second storage section 15b.

The basic operation of a key backlight lighting control function 4 is the same as that in the
15 first embodiment. When, however, the user settings (b) are stored, the storage area for the user settings (b) is preferentially referred to, and an LED circuit 2 is lighted in accordance with the combinations of character input modes and corresponding key backlight lighting
20 colors which are designated by the user.

According to this embodiment, the combinations of character input modes and corresponding key backlight lighting colors can be changed in accordance with the preferences of the user, as needed. In addition, since
25 different storage areas are provided for the initial settings (a) and user settings (b), the initial settings are not overwritten and changed, and the user can return

to the initial settings (a) as needed.

The third embodiment of the present invention will be described next with reference to Fig. 5.

The third embodiment differs from the first
5 embodiment in that it has application software 8. In
this embodiment, the programs created by JAVA
(registered trademark) or the like are downloaded into a
software section. If the downloaded application
software 8 includes key backlight application setting
10 lighting color data 9 and key backlight application
setting lighting position data 10, a key backlight
lighting control function 4 refers to these data.

In this case, the key backlight application
setting lighting color data 9 is data which defines
15 combinations of character input modes and lighting
colors, and the key backlight application setting
lighting position data 10 is data which defines the
positions of keys prepared for the respective character
input modes, which can be used for character input
20 operation. This application is stored in a second
storage section 15b.

The key backlight lighting control function 4
refers to the key backlight application setting lighting
color data 9 and key backlight application setting
25 lighting position data 10 while the application software
8 is executed.

This operation makes it possible to perform

LED control by operation similar to character input operation. As a consequence, scene changes and keys that can be used for input operation can be displayed with key backlights so as to be visually discriminated.

5 Fig. 6 shows cell phone incorporating the key input device according to the above embodiment. A cell phone 151 includes an antenna 152 and operation key section 154, like the cell phone 51 described with reference to Fig. 7. An operation key section 154
10 includes a plurality of keys such as dial number keys 154a, a signal transmission/reception key, an on-hook key 154b, a mail key 154c, and various setting keys.

 The operation key section 154 also includes a multicolor light-emitting section (key backlight) 155
15 which is placed on the lower surface of the multicolor light-emitting section 155 and lighted in a plurality of colors. The multicolor light-emitting section 155 includes a plurality of light-emitting portions 155a provided for the respective keys. In synchronism with a
20 character input mode, the light-emitting portions 155a light all the operation keys or only corresponding keys that can be used for input operation in a corresponding color.

 The above embodiment has been described on the
25 premise that the present invention is applied to the operation key section of the cell phone. However, the present invention can also be applied to other mobile

terminals, personal computers, and the like which have a key input section designed to perform key input operation while switching a plurality of character input modes.

5 According to the present invention, the lighting color of the key backlight allows the user to visually recognize the current character input mode, whereas the lighting position of the key backlight allows the use to visually recognize each key that can
10 be used for key input operation. This makes it possible to efficiently perform character input operation.

 In addition, the user can visually recognize switching of character input modes in accordance with the lighting color of the backlight and a change in
15 light position. This can therefore prevent the user from making an input error without noticing a change in the icon on the screen.